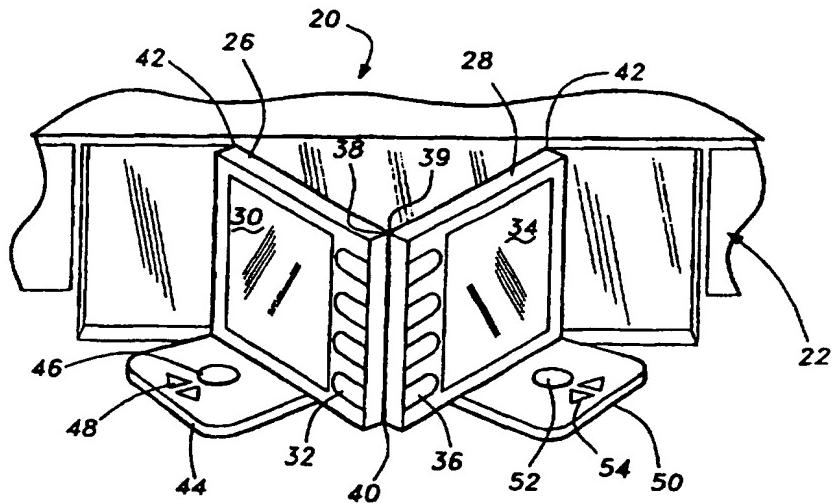




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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B60R 11/02		(43) International Publication Date: 12 March 1998 (12.03.98)
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(54) Title: DUAL SCREEN DISPLAY DEVICE



## (57) Abstract

A system (20) for displaying electronically generated images within a vehicle includes two display screens (30, 34). One display screen (30) is dedicated to displaying images for the driver of the vehicle while the second display screen (34) is dedicated to generating images for a passenger of the vehicle. The images on the two display screens (30, 34) are generated independently of each other. The display screens (30, 34) preferably are mounted on frames (26, 28) that are movable relative to each other and the interior of the vehicle so that one screen (30) is viewable to the driver and the other (34) faces a passenger.

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## DUAL SCREEN DISPLAY DEVICE

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### BACKGROUND OF THE INVENTION

This invention relates to a system for displaying electronically generated images on more than one display screen within a vehicle.

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The introduction of electronic displays within vehicles created the possibility of increased versatility in supplying information to a driver, for example. Presently proposed display systems, however, are not without limitations. For example, there is a limited amount of space available within the interior of a vehicle for placement of a display screen. Similarly, the size 15 of a display screen is necessarily limited. Therefore, there is a need for a strategic placement of a display system within the vehicle.

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Currently proposed systems have other shortcomings and drawbacks. For example, the placement of a display screen can be distracting to the driver of the vehicle because of its placement relative to the driver's normal seating position. It is important to minimize the amount of distraction a driver experiences from concentrating on the task of driving the vehicle. Additionally, some images displayed on a display screen may not be appropriate for a driver under most conditions. In some localities, the type of information that can be displayed on a display screen is limited by law. The same limitations do not apply to passengers within a vehicle, however. Therefore, it would be useful to provide a system that enables a driver to view 20 certain information while a passenger can view different images.

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This invention addresses the needs and shortcomings of currently proposed systems. This invention provides a unique dual-screen display system that enables a driver to easily view certain images while a passenger views different images, independent of the driver.

SUMMARY OF THE INVENTION

In general terms, this invention is a system for displaying visual images within a vehicle. The system includes a first frame supported in the vehicle such that the first frame is movable between a plurality of positions. A first display screen is supported on the first frame. A second frame is supported in the vehicle such that it is movable between a plurality of positions. A second display screen is supported on the second frame. A controller is coupled to the first and second display screens and controls a displayed image on each screen such that a display on the first display screen is independent of a displayed image on the second display screen.

In the preferred embodiment, the first and second frames are supported on an instrument panel within the vehicle passenger compartment. The two frames are hingedly connected together at one edge so that they are movable relative to each other. The first and second display screens can, therefore, be oriented so that they are angled toward a driver and passenger, respectively.

The first and second frames preferably are moved between a storage position, where the first and second display screens are generally co-planar and a plurality of use positions where the screens are angled relative to each other. The system preferably includes a movable cover that covers over the display screens when they are in the storage position. A sensor determines when the cover is moved over the display screens and communicates that information to the controller. The controller responsively puts the display screens into a screen-saver mode and no image is displayed on the screens when they are in such an arrangement.

The various features and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the presently preferred embodiment. The drawings that accompany the detailed description can be described as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagrammatic illustration of a display system designed according to this invention.

5       Figure 2 is a diagrammatic illustration of the embodiment of Figure 1 showing display screens in a use position.

Figure 3 is a diagrammatic illustration of the embodiment of Figure 1 showing display screens in a storage position.

10      Figure 4 is a schematic illustration of a system designed according to this invention.

Figure 5 is a diagrammatic illustration of an alternative embodiment of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

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Figure 1 diagrammatically illustrates a visual display system 20 within a vehicle interior. In the illustrated embodiment, the display system 20 is supported on an instrument panel 22 in the general vicinity of a steering wheel 24. The display system 20 includes a first frame 26 and a second frame 28. A first display screen 30 is supported on the first frame 26. A plurality of control switches 32 are supported on the first frame 26. The control switches 32 are useful for adjusting or manipulating the display on the first display screen 30.

20      Similarly, a second display screen 34 is supported on a second frame 28. A plurality of control switches 36 are supported on the second frame 28 for adjusting and manipulating the display on the display screen 34.

25      In Figure 1, the first frame 26 and the second frame 28 are positioned so that the first screen 30 and the second screen 34 are generally co-planar. The first frame 26 and the second frame 28 preferably are movable relative to each other and the instrument panel 22 so that the first display screen 30 and

the second display screen 34 are movable between a plurality of viewing positions.

Figure 2 illustrates a preferred orientation of the first frame 26 and the second frame 28 where the first display screen 30 is viewable by the driver of the vehicle and the second display screen 34 is viewable by a passenger. An edge 38 on the first frame 26 preferably is hingedly connected to an edge 39 on the second frame 28. Accordingly, the first frame 26 and the second frame 28 pivot relative to each other about the hinged connection 40. Pivotal and slid able connections 42 preferably are provided at opposite ends of the first and second frames to facilitate movement of the first and second frames between the generally co-planar position illustrated in Figure 1 and the outwardly protruding angled position illustrated in Figure 2. The specific hardware and configuration of the first frame 26 and second frame 28, the hinged connection 40 and the pivotal and slid able connections 42 can be developed by those skilled in the art and, therefore, need not be described in further detail in this specification.

A first shelf portion 44 includes a control knob 46 and a pair of control buttons 48. The control knob 46 and control buttons 48 are manipulable by a user (in this case the driver of the vehicle) to make adjustments and selections for altering the display on the display screen 30. Similarly, a second shelf portion 50 is provided with a control knob 52 and control buttons 54 for adjusting the display on the second display screen 34. The control knobs 46 and 52 preferably are multiple purpose knobs that can be pressed and rotated while the control buttons 48 and 54 preferably are two-position, pressable switches.

The first shelf portion 44 and the second shelf portion 50 preferably are supported at an angled position relative to the first and second frames, respectively. The shelf portions preferably are also movable between a use position (as illustrated in Figure 2, for example) and a storage position where the shelf portions are tucked away into the instrument panel 22. Any physical arrangement of the shelf portions relative to the frames that allow for the shelf

portions to be moved between a storage position and a use position could be incorporated within the scope of this invention.

Figure 3 illustrates the first frame 26 and the second frame 28 in a generally co-planar alignment, which can be referred to as a storage position. A movable cover 60 preferably is provided for protecting the display screens 30 and 34 when they are not in use. The cover 60 preferably slides between a covering position where the cover 60 generally extends over the display screens and a storage position where the cover is tucked away inside the instrument panel 22.

Referring now to Figure 4, further components of the display system 20 are schematically illustrated. A first control module 62 is coupled to the first display screen 34 while a second control module 64 is coupled to the second display screen 34. The control module 62 and 64 are coupled with a video controller 66. The video controller is any computer or micro-processor that is commercially available and usable for controlling images on a display screen, for example. The divisions of the controller 66 and the first and second control modules 62 and 64 are for schematic illustration purposes only. The functions of each that are described in this specification could be incorporated into a single microprocessor or computer as will be appreciated by those skilled in the art.

The video controller 66 controls the images to be displayed on the two display screens. The first control module 62 is an interface between the controller 66 and the first display screen 30 so that an image on the first display screen can be controlled through the controller 66 independently of an image on the second display screen 34. The control module 62 also facilitates the ability of the controller 66 to adjust the image on the display screen 30 in response to manipulation of the control switches 32, the control knob 46 or the control buttons 48. The same is true of the second control module 64, with respect to the second display screen 34.

The controller 66 preferably is also coupled to a plurality of vehicle sub-systems. Example sub-systems include the heating, ventilation and air

conditioning system 70, a radio 72 and cruise control 74. In the preferred embodiment, the controller 66 not only controls images on the display screens 30 and 34 but also controls the operation of the vehicle sub-systems to which it is connected. In the preferred embodiment, the driver is able to utilize one 5 of the control switches 32 to have the radio sub-system displayed on the first display screen 30. The driver can then make changes to the radio operation by manipulating the control knob 46 and the control buttons 48, for example. The controller 66 then responsively changes the operation of the radio to make it consistent with a display on the display screen 30. The passenger preferably 10 is provided similar privileges. Because the images on the two display screens are independent, however, in the preferred embodiment certain functions available to the driver are not available to the passenger and vice versa.

Referring back to Figure 3, a position sensor 61 detects a position of the cover 60. When the cover 60 is in the position to cover over the display 15 screens in the storage position, the position sensor 61 communicates with the controller 66. The controller 66 determines that the cover 60 is covering over the display screens and responsively institutes a screen-saver mode so that the display screens do not display any image.

Figure 5 illustrates an alternative embodiment of this invention. Figure 20 5 illustrates the first display screen 30 supported on a visor 80 that is mounted within the vehicle on the driver's side of the vehicle by a conventional mount 82. The second display screen 34 preferably is mounted on a visor on the passenger's side of the vehicle in like manner. The visor 80 includes a cover 84 that is movable between a storage position and a position where it covers 25 over the display screen 30. A position sensor 86 detects when the cover 84 is in a position to cover over the display screen 30 and communicates that information with the controller 66. In that instance, the controller 66 places the display screen 30 into a screen-saver mode to preserve the display screen 30 and to conserve energy within the system.

The visor 80 is movable through a plurality of positions. In the preferred embodiment, the control module 62 communicates with a visor 30

position sensor 88, which indicates the position of the visor 80 relative to the roof of the vehicle. The control module 62 preferably is programmed to adjust an image on the display screen 30 depending on the position of the visor 80. For example, when the visor is in a generally vertical position, (i.e., generally perpendicular to the roof of the vehicle) the image on the display screen is generated in a first mode. When the visor 80 is tilted toward or away from the driver, however, an adjustment must be made for clear viewing of an image on the screen 30. The control module 62 preferably is programmed to make adjustments to the image so that it can be easily seen by the driver of the vehicle whenever the visor 80 is positioned within an acceptable range of angular orientations relative to the roof of the vehicle. One skilled in the art can develop specific code to program the control module 62 or the controller 66 to accomplish the just-described results.

The foregoing description is exemplary rather than limiting in nature. Variations and modifications to the disclosed embodiments will become apparent to those skilled in the art that do not necessarily depart from the purview and spirit of this invention. Accordingly, the legal scope of this invention can only be determined by studying the following claims.

CLAIMS

What is claimed is:

5        1. A device for displaying an electronically generated image, comprising:

a frame including two panel support surfaces;

a first display screen supported on one of said panel support surfaces;

10        a second display screen supported on the other of said panel support surfaces;

a first control switch supported near said first display screen that is manipulable to control a display on said first display screen;

15        a second control switch supported near said second display screen that is manipulable to control a display on said second display screen; and

wherein said panel support surfaces are moveable relative to each other between a first position where said first and second display screens are generally co-planar and a second position where said first and second display screens are angled relative to each other.

20        2. The device of claim 1, wherein said two panel support surfaces each include a front face and first and second ends at opposite sides of said front faces, said display screens being supported on said panel support surfaces such that said screens are generally co-planar with said front faces, respectively, said first ends of said support surfaces being adjacent each other and hingedly connected such that said support surfaces are moveable between said first and second positions.

25        3. The device of claim 2, wherein said frame is supported on an instrument panel within a vehicle and wherein said second ends of said support surfaces are pivotally and slidably supported on said instrument panel such that

said second ends pivot and slide relative to said instrument panel when said panel support surfaces are moved between said first and second positions.

4. The device of claim 3, further comprising a cover that is supported on said instrument panel and moveable between a first cover position where said cover covers over said frame and display screens when said panel support surfaces are in said first position and a second cover position where said display screens are not covered by said cover.

5 10 15 5. The device of claim 1, further comprising a first shelf portion that is supported to extend generally away from said first display screen and a second shelf portion that is supported to extend generally away from said second display screen, and wherein each said shelf portion includes at least one control knob that is manipulable to control a displayed image on a respective display screen.

6. The device of claim 5, wherein said first and second shelf portions are moveable relative to said panel support surfaces between a use position where said control knob is accessible to a user for controlling a displayed image and a storage position.

7. A system for displaying visual images within a vehicle, comprising:

25 a first frame supported in the vehicle such that said first frame is moveable between a plurality of positions;

a first display screen supported on said first frame;

a second frame supported in the vehicle such that said second frame is moveable between a plurality of positions;

30 a second display screen supported on said second frame; and

a controller that is coupled to said first and second display screens and controls a displayed image on each screen such that a displayed image on said

first display screen is independent of a displayed image on said second display screen.

8. The system of claim 7, wherein said first frame is supported on  
5 a first visor within the vehicle and wherein said second frame is supported on  
a second visor within the vehicle, said first and second visors being moveable  
between a plurality of positions.

9. The system of claim 8, further comprising a first position sensor  
10 that senses a position of said first visor and a second position sensor that  
senses a position of said second visor, said position sensors communicating  
with said controller such that said controller adjusts a display on said first  
display screen responsive to a position of said first visor and wherein said  
controller adjusts a display on said second display screen responsive to a  
15 position of said second visor.

10. The system of claim 7, wherein said first frame includes an  
edge, said second frame includes and edge that is adjacent said first frame  
edge and wherein said edges are hingedly connected such that said first and  
20 second frames are hingedly moveable relative to each other.

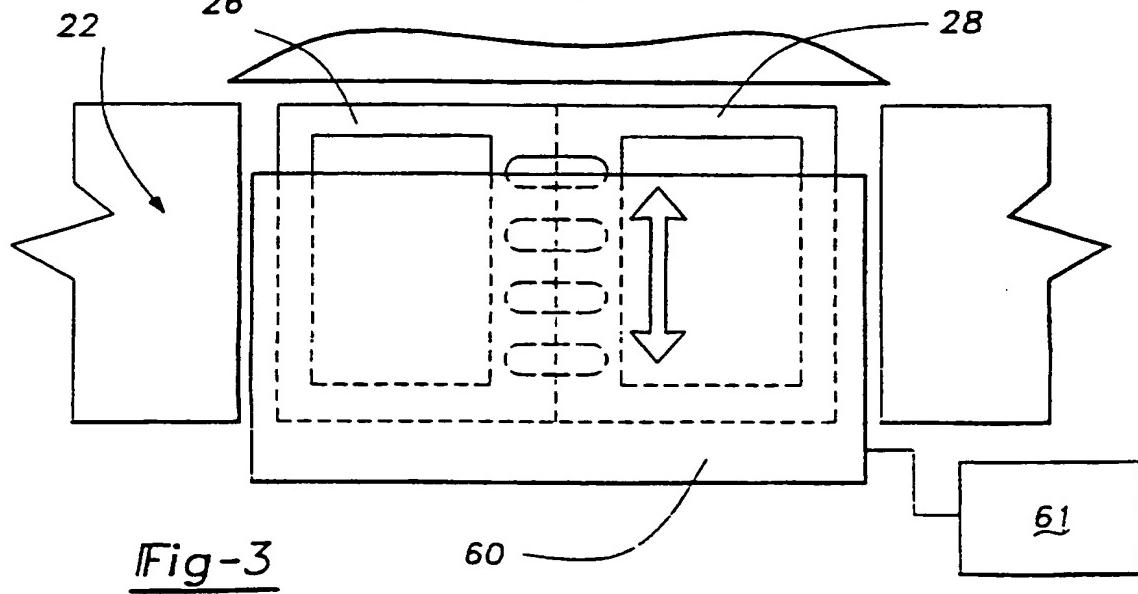
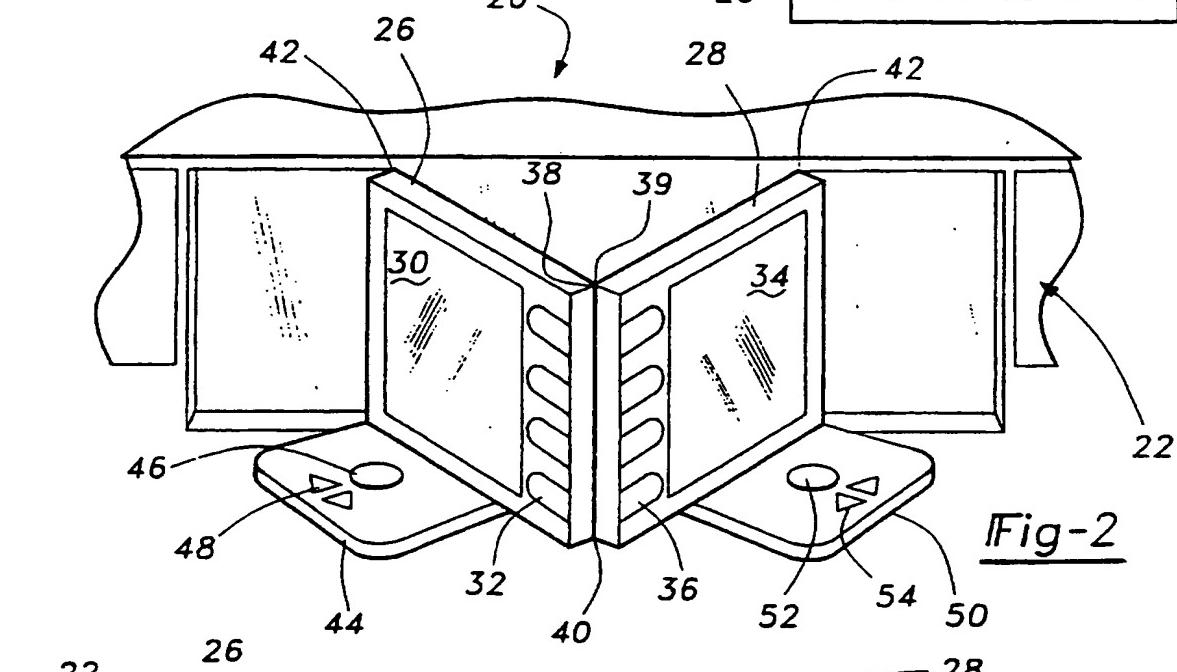
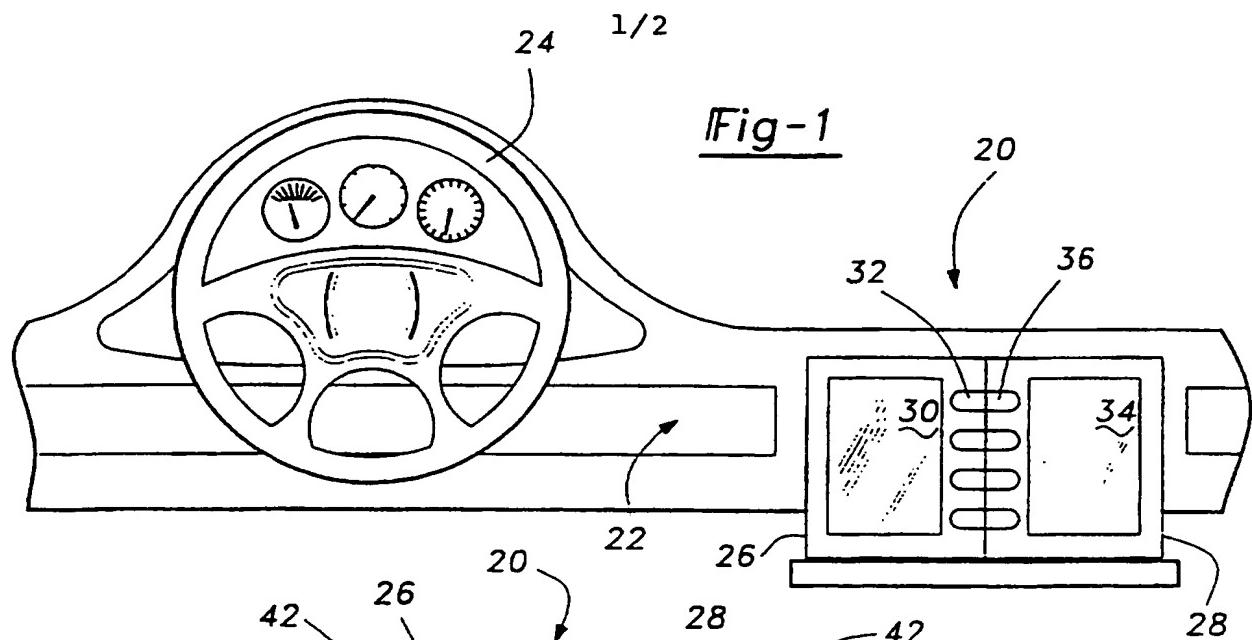
11. The system of claim 7, further comprising a first plurality of  
selection switches supported on said first frame and a second plurality of  
selection switches supported on said second frame, said selection switches  
25 being manipulable to select an image to be displayed on said display screens,  
respectively.

12. The system of claim 11, wherein said controller is coupled to  
a plurality of subsystems within the vehicle and wherein said controller  
30 controls said display screens to display one of said subsystems responsive to  
one of said selection switches being manipulated by a user of said system.

13. The system of claim 12, further comprising a first control knob for adjusting a display on said first display screen and a second control knob for adjusting a display on said second display screen, and wherein said controller alters an operation condition of a displayed vehicle subsystem responsive to said control knobs being manipulated.

14. The system of claim 7, further comprising a first shelf portion supported near said first frame and including a first control knob that is manipulable to adjust an image on said first display screen and a second shelf portion supported near said second frame and including a second control knob that is manipulable to adjust an image on said second display screen, said shelf portions being moveable between a use position where said control knobs are accessible to a user and a storage position.

15. The system of claim 7, further comprising a cover that is moveable between a covering position where said cover is generally over said display screens and a storage position and wherein said controller determines a position of said cover and automatically controls said display screens such that said display screens do not display an image when said cover is in said covering position.



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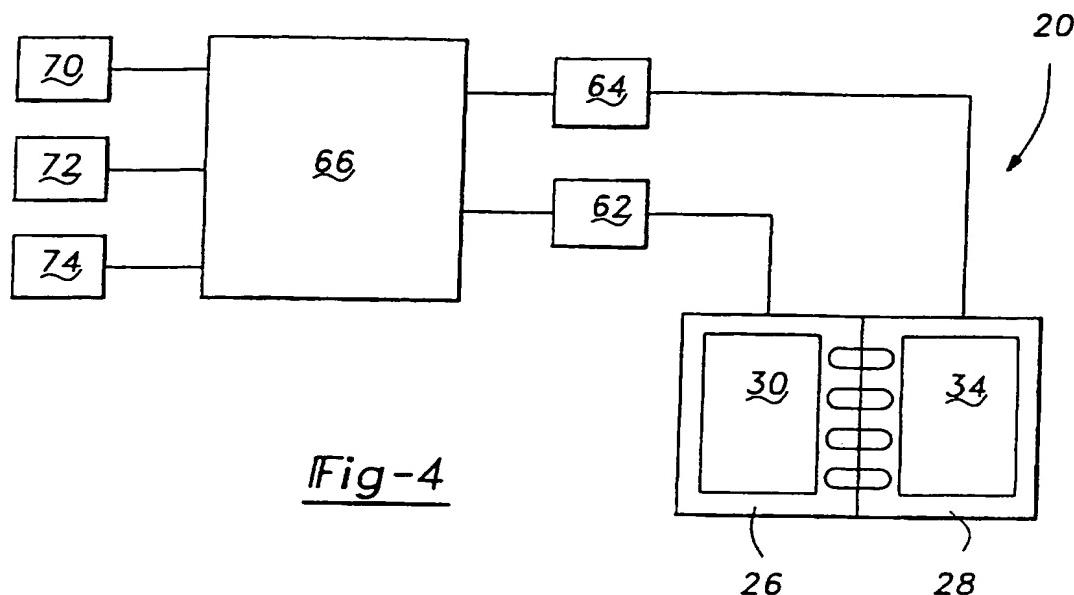


Fig-4

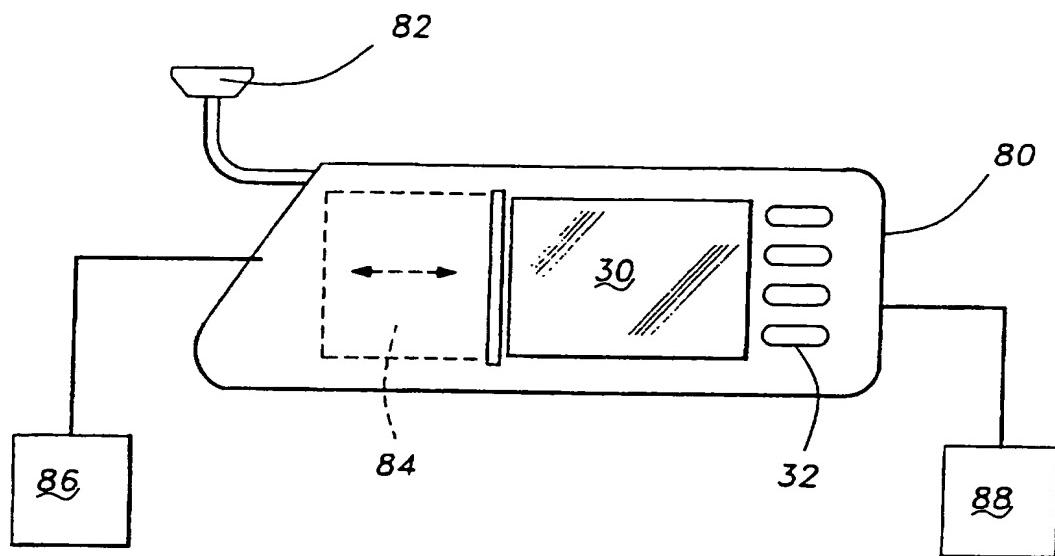


Fig-5

## INTERNATIONAL SEARCH REPORT

Int'l. Application No.

PCT/US 97/15059

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 B60R11/02

According to International Patent Classification(IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbol(s))  
IPC 6 B60R G08B G06F G01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 534 888 A (LEBBY MICHAEL S ET AL) 9 July 1996 see figure 4 see abstract see column 4, line 65 - column 5, line 15 ---	1,2,7, 10,11
X	GB 2 183 886 A (BOTTRIELL REGINALD PAUL) 10 June 1987 see figures 1-8,10 see page 1, line 1 - line 16 see page 1, line 82 - line 118 see page 2, column 2 - column 3 ---	1,2,7, 10,11
A	DE 42 18 179 A (MATTHES WOLFGANG PROF DR) 9 December 1993 see figures 1-8 see claims ---	3
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 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 42 23 354 A (NAUJOKS GEORG) 20 January 1994 see claims; figures ---	1,2,7, 10,11
X	DE 42 13 129 A (AUDI NSU AUTO UNION AG) 28 October 1993 see claims; figures ---	7
A	DE 296 08 032 U (MAN TECHNOLOGIE GMBH) 18 July 1996 see claims; figures ---	1,8
Y	FR 2 677 313 A (DAIMLER BENZ AG) 11 December 1992 see figures see abstract ---	7,8,11
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Information on patent family members

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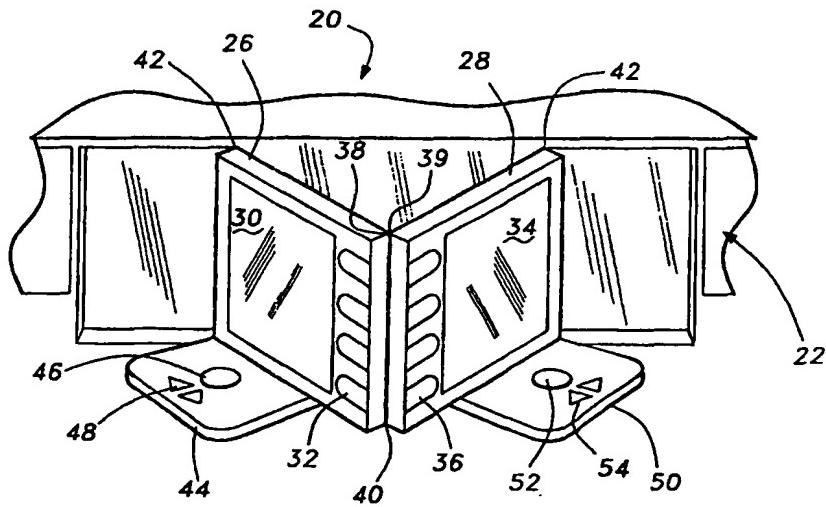
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EP 0409232 A	23-01-91	DE 69008260 D DE 69008260 T	26-05-94 25-08-94



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(21) International Application Number: PCT/US97/15059		(81) Designated States: CA, JP, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
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(30) Priority Data: 08/707,154 3 September 1996 (03.09.96) US		Published <i>With international search report.</i> <i>With amended claims.</i>
(71) Applicant: UNITED TECHNOLOGIES AUTOMOTIVE, INC. [US/US]; 5200 Auto Club Drive, Dearborn, MI 48126 (US).		Date of publication of the amended claims: 30 April 1998 (30.04.98)
(72) Inventor: HARTMAN, Hollister, A.; 45171 Emery, Northville, MI 48167 (US).		
(74) Agents: OLDS, Theodore, W. et al.; Howard & Howard Attorneys, P.C., Suite 101, 1400 North Woodward Avenue, Bloomfield Hills, MI 48304 (US).		

(54) Title: DUAL SCREEN DISPLAY DEVICE



## (57) Abstract

A system (20) for displaying electronically generated images within a vehicle includes two display screens (30, 34). One display screen (30) is dedicated to displaying images for the driver of the vehicle while the second display screen (34) is dedicated to generating images for a passenger of the vehicle. The images on the two display screens (30, 34) are generated independently of each other. The display screens (30, 34) preferably are mounted on frames (26, 28) that are movable relative to each other and the interior of the vehicle so that one screen (30) is viewable to the driver and the other (34) faces a passenger.

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**AMENDED CLAIMS**

[received by the International Bureau on 9 March 1998 (09.03.98);  
original claims 1-15 replaced by amended claims 1-14 (5 pages)]

1. A device (20) for displaying an electronically generated image, comprising:
  - a frame including two panel support surfaces (26,28);
  - a first display screen (30) supported on one of said panel support surfaces (26);
  - a second display screen (34) supported on the other of said panel support surfaces (28);
    - a first control switch (32) supported near said first display screen that is manipulable to control a display on said first display screen;
    - a second control switch (36) supported near said second display screen that is manipulable to control a display on said second display screen; and

characterized by said frame being supported on an instrument panel (22) within a vehicle and wherein said panel support surfaces are moveable relative to each other between a first position where said first and second display screens are generally co-planar and a second position where said first and second display screens are angled relative to each other.

  
  2. The device of claim 1, wherein said two panel support surfaces each include a front face and first and second ends at opposite sides of said front faces, said display screens being supported on said panel support surfaces such that said screens are generally co-planar with said front faces, respectively, said first ends of said support surfaces being adjacent each other and hingedly connected such that said support surfaces are moveable between said first and second positions.

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3. The device of claim 2, wherein said second ends of said support surfaces are pivotally and slidably supported on said instrument panel such that said second ends pivot and slide relative to said instrument panel when said panel support surfaces are moved between said first and second positions.

4. The device of claim 3, further comprising a cover (60) that is supported on said instrument panel and moveable between a first cover position where said cover covers over said frame and display screens when said panel support surfaces are in said first position and a second cover position where said display screens are not covered by said cover.

5. The device of claim 1, further comprising a first shelf portion (44) that is supported to extend generally away from said first display screen and a second shelf portion (50) that is supported to extend generally away from said second display screen, and wherein each said shelf portion includes at least one adjustment switch (46, 52) that is manipulable to control a displayed image on a respective display screen.

6. The device of claim 5, wherein said first and second shelf portions are moveable relative to said panel support surfaces between a use position where said adjustment switch is accessible to a user for controlling a displayed image and a storage position.

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7. A system (20) for displaying visual images within a vehicle, comprising:
  - a first frame (26) supported in the vehicle such that said first frame is moveable between a plurality of positions;
  - a first display screen (30) supported on said first frame;
  - a second frame supported (28) in the vehicle such that said second frame is moveable between a plurality of positions;
  - a second display screen (34) supported on said second frame;
  - a controller (66) that is coupled to said first and second display screens and controls a displayed image on each screen such that a displayed image on said first display screen is independent of a displayed image on said second display screen; and
  - characterized by said first frame (26) being supported on a first visor (80) within the vehicle and wherein said second frame (28) is supported on a second visor within the vehicle, said first and second visors being moveable between a plurality of positions.

8. The system of claim 7, further comprising a first position sensor (88) that senses a position of said first visor and a second position sensor that senses a position of said second visor, said position sensors communicating with said controller (66) such that said controller adjusts a display on said first display screen responsive to a position of said first visor and wherein said controller adjusts a display on said second display screen responsive to a position of said second visor.

9. The system of claim 7, wherein said first frame includes an edge, said second frame includes and edge that is adjacent said first frame edge and wherein said edges are

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hingedly connected such that said first and second frames are hingedly moveable relative to each other.

10. The system of claim 7, further comprising a first plurality of selection switches (32) supported on said first frame and a second plurality of selection switches (36) supported on said second frame, said selection switches being manipulable to select an image to be displayed on said display screens, respectively.

11. The system of claim 10, wherein said controller (66) is coupled to a plurality of subsystems within the vehicle and wherein said controller controls said display screens to display one of said subsystems responsive to one of said selection switches being manipulated by a user of said system.

12. The system of claim 11, further comprising a first adjustment switch (46) for adjusting a display on said first display screen and a second adjustment switch (52) for adjusting a display on said second display screen, and wherein said controller (66) alters an operation condition of a displayed vehicle subsystem responsive to said control knobs being manipulated.

13. The system of claim 7, further comprising a first shelf portion (44) supported near said first frame and including a first adjustment switch (46) that is manipulable to adjust an image on said first display screen and a second shelf portion (50) supported near said second frame and including a second adjustment switch (52) that is manipulable to adjust an

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image on said second display screen, said shelf portions being moveable between a use position where said adjustment switches are accessible to a user and a storage position.

14. The system of claim 7, further comprising a cover (84) that is moveable between a covering position where said cover is generally over said display screens and a storage position and wherein said controller (66) determines a position of said cover and automatically controls said display screens such that said display screens do not display an image when said cover is in said covering position.